

Applicant: Sebastian KANNE et al.
Docket No. R.305558
Preliminary Amdt.

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-9 (Canceled).

10. **(New)** In an injector for fuel injection systems of internal combustion engines, in particular direct-injection diesel engines, the injector having a piezoelectric actuator located in an injector body and held in contact with the injector body on one side and with a sleeve-like booster piston on the other via first spring means, the sleeve-like booster piston having an inner chamber, a nozzle body, which is joined to the injector body and having at least one nozzle outlet opening, a stepped nozzle needle guided axially displaceably in the nozzle body, second spring means disposed inside the booster piston, which second spring means, together with the injection pressure acting on the back side of the nozzle needle, - keeps the nozzle needle in the closing position, and a control chamber embodied on the end toward the nozzle needle of the booster piston and which communicates, via at least one leakage gap, with a fuel supply that is at injection pressure, the nozzle needle being urged in the opening direction by the fuel located in the control chamber, the improvement wherein the booster piston actuated by the piezoelectric actuator is spatially associated directly with the nozzle needle, in such a way that the nozzle needle is fitted, with a rear region that has a

larger diameter than a region of the nozzle needle toward the nozzle outlet, into the inner chamber of the booster piston.

11. **(New)** The injector according to claim 10, wherein the nozzle body adjoins the injector body on the face end in the flow direction, and wherein the piezoelectric actuator extends substantially as far as the (lower) end, toward the nozzle body, of the injector body.

12. **(New)** The injector according to claim 10, wherein the cylindrical piezoelectric actuator is centered in an axial cylindrical recess of the injector body in such a way that an annular chamber is created between the outer wall of the piezoelectric actuator and the inner wall of the cylindrical recess of the injector body, and wherein the annular chamber communicates hydraulically directly with the fuel supply that is at injection pressure (high pressure).

13. **(New)** The injector according to claim 11, wherein the cylindrical piezoelectric actuator is centered in an axial cylindrical recess of the injector body in such a way that an annular chamber is created between the outer wall of the piezoelectric actuator and the inner wall of the cylindrical recess of the injector body, and wherein the annular chamber communicates hydraulically directly with the fuel supply that is at injection pressure (high pressure).

14. **(New)** The injector according to claim 12, wherein the annular chamber also extends into the region of the booster piston axially adjoining the piezoelectric actuator, and wherein

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the inner chamber of the booster piston communicates hydraulically with the annular chamber and thus with the fuel supply.

15. **(New)** The injector according to claim 13, wherein the annular chamber also extends into the region of the booster piston axially adjoining the piezoelectric actuator, and wherein the inner chamber of the booster piston communicates hydraulically with the annular chamber and thus with the fuel supply.

16. **(New)** The injector according to claim 14, further comprising a compression spring concentrically surrounding the booster piston and located in the (lower) region of the annular chamber associated with the booster piston, the compression spring being braced, toward the piezoelectric actuator, on a collar of the booster piston and, toward the nozzle outlet, on a rear (upper) end face of the nozzle body, in such a way that the piezoelectric actuator and the booster piston are kept in contact with one another by nonpositive engagement.

17. **(New)** The injector according to claim 15, further comprising a compression spring concentrically surrounding the booster piston and located in the (lower) region of the annular chamber associated with the booster piston, the compression spring being braced, toward the piezoelectric actuator, on a collar of the booster piston and, toward the nozzle outlet, on a rear (upper) end face of the nozzle body, in such a way that the piezoelectric actuator and the booster piston are kept in contact with one another by nonpositive engagement.

18. **(New)** The injector according to claim 10, wherein the nozzle needle is guided in the inner chamber of the booster piston, forming a cylindrical leakage gap, in such a way that a hydraulic communication is created between the inner chamber of the booster piston, which is at injection pressure (high pressure), and the control chamber.

19. **(New)** The injector according to claim 11, wherein the nozzle needle is guided in the inner chamber of the booster piston, forming a cylindrical leakage gap, in such a way that a hydraulic communication is created between the inner chamber of the booster piston, which is at injection pressure (high pressure), and the control chamber.

20. **(New)** The injector according to claim 12, wherein the nozzle needle is guided in the inner chamber of the booster piston, forming a cylindrical leakage gap, in such a way that a hydraulic communication is created between the inner chamber of the booster piston, which is at injection pressure (high pressure), and the control chamber.

21. **(New)** The injector according to claim 10, wherein the booster piston is guided in the nozzle body, forming a (further) leakage gap, in such a way that a hydraulic communication is created between the annular chamber that is at injection pressure (high pressure) and the control chamber.

22. **(New)** The injector according to claim 11, wherein the booster piston is guided in the nozzle body, forming a (further) leakage gap, in such a way that a hydraulic communication is

created between the annular chamber that is at injection pressure (high pressure) and the control chamber.

23. **(New)** The injector according to claim 14, wherein the booster piston is guided in the nozzle body, forming a (further) leakage gap, in such a way that a hydraulic communication is created between the annular chamber that is at injection pressure (high pressure) and the control chamber.

24. **(New)** The injector according to claim 10, further comprising a cylindrical pressure chamber in the region of the nozzle body toward the nozzle outlet and surrounding the nozzle needle, the cylindrical pressure chamber communicating hydraulically with the fuel supply that is at injection pressure (high pressure), and a axial recess in the nozzle body, to the rear of the cylindrical pressure chamber, in which recess the nozzle needle is guided, forming a further leakage gap, in such a way that a hydraulic communication is created between the cylindrical pressure chamber that is at injection pressure (high pressure) and the control chamber.

25. **(New)** The injector according to claim 12, further comprising a cylindrical pressure chamber in the region of the nozzle body toward the nozzle outlet and surrounding the nozzle needle, the cylindrical pressure chamber communicating hydraulically with the fuel supply that is at injection pressure (high pressure), and a axial recess in the nozzle body, to the rear of the cylindrical pressure chamber, in which recess the nozzle needle is guided, forming a

further leakage gap, in such a way that a hydraulic communication is created between the cylindrical pressure chamber that is at injection pressure (high pressure) and the control chamber.

26. **(New)** The injector according to claim 14, further comprising a cylindrical pressure chamber in the region of the nozzle body toward the nozzle outlet and surrounding the nozzle needle, the cylindrical pressure chamber communicating hydraulically with the fuel supply that is at injection pressure (high pressure), and a axial recess in the nozzle body, to the rear of the cylindrical pressure chamber, in which recess the nozzle needle is guided, forming a further leakage gap, in such a way that a hydraulic communication is created between the cylindrical pressure chamber that is at injection pressure (high pressure) and the control chamber.

27. **(New)** The injector according to claim 10, further comprising a union nut (clamping nut) securing the nozzle body to the injector body and a cylindrical gap between the outer wall of the nozzle body and the inner wall of the union nut, the cylindrical gap communicating hydraulically, via recesses machined into the nozzle body, on one side with the annular chamber and on the other with the cylindrical pressure chamber.

28. **(New)** The injector according to claim 11, further comprising a union nut (clamping nut) securing the nozzle body to the injector body and a cylindrical gap between the outer wall of the nozzle body and the inner wall of the union nut, the cylindrical gap communicating

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hydraulically, via recesses machined into the nozzle body, on one side with the annular chamber and on the other with the cylindrical pressure chamber.

29. **(New)** The injector according to claim 12, further comprising a union nut (clamping nut) securing the nozzle body to the injector body and a cylindrical gap between the outer wall of the nozzle body and the inner wall of the union nut, the cylindrical gap communicating hydraulically, via recesses machined into the nozzle body, on one side with the annular chamber and on the other with the cylindrical pressure chamber.